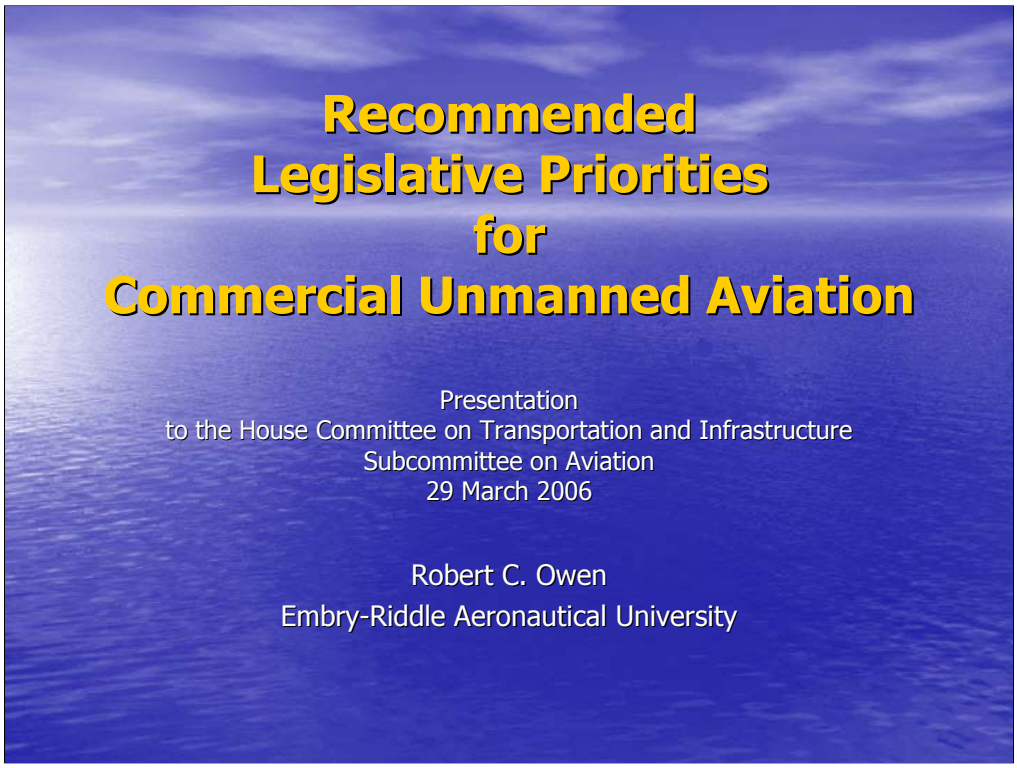
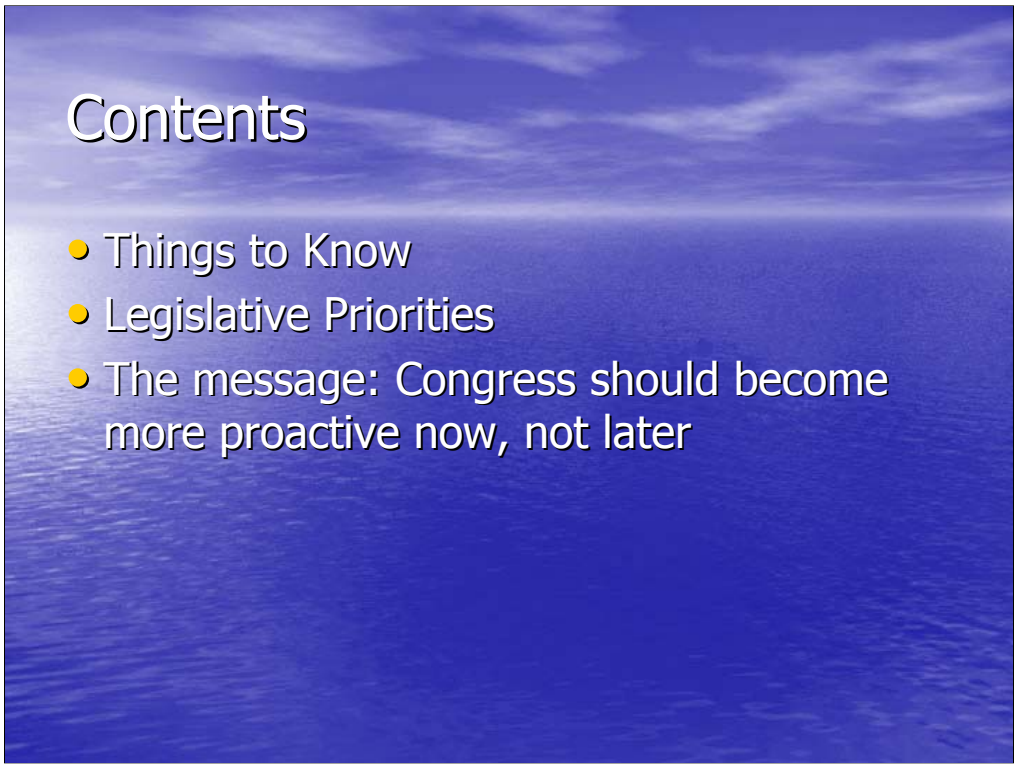


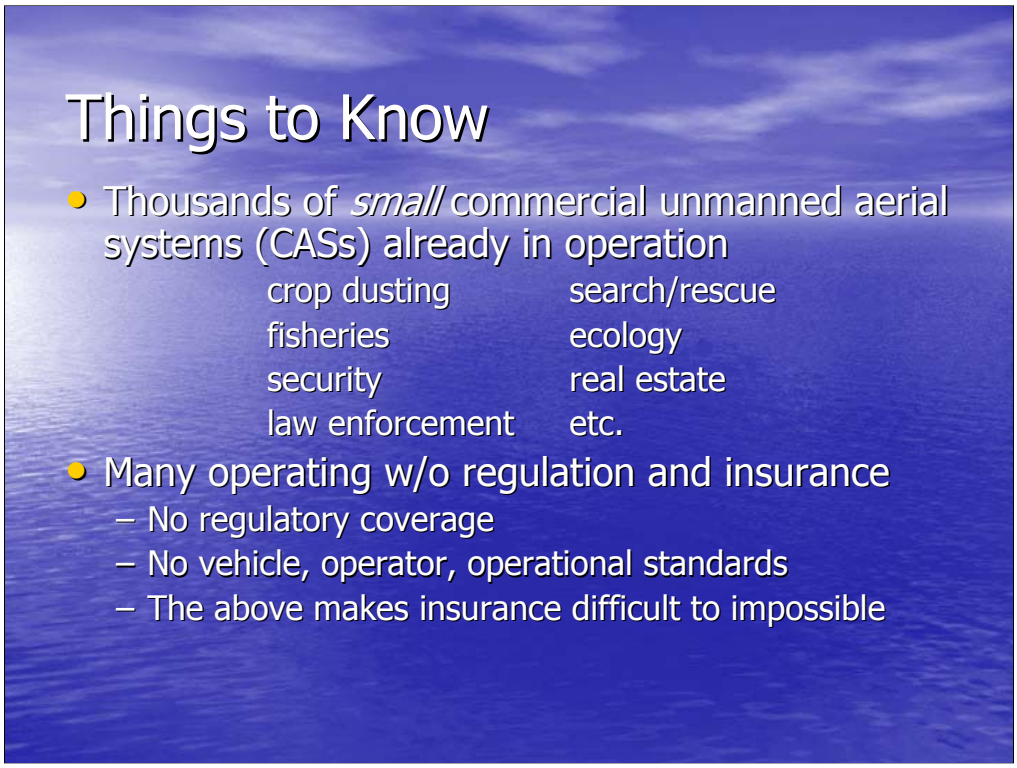
Members of the Committee and other's attending this session, first let me say that I am honored to be here. Effective Congressional oversight and legislative action will be a vital element of America's success and leadership in the realms of unmanned aviation (UA), specifically, and unmanned systems in general. I look forward, therefore, to Congress' increasing engagement in this important issue.

If I may impose on you just for a moment, I want to explain Embry-Riddle Aeronautical University's interest in unmanned aviation. Riddle consists of two residential campuses at Daytona Beach, Florida, and Prescott, Arizona, as well as an extended campus delivering courses at over 130 sites globally. As the world's only university centered on aviation, we take a broad interest in anything that has to do with building aircraft, conducting and supporting flight operations, and managing aviation business. This interest extends to unmanned aviation, of course. Currently, we are addressing UA through a 30+ member, multi-discipline Faculty Consortium, of which I am the Chair, and through a variety of engineering, flight test, human factors, air traffic and flight simulation, and policy development.



Given the generally undeveloped understanding of unmanned aviation as a policy and economic issue, particularly in the commercial realm, I intend today only to lay out a few important "truths" of *commercial* unmanned aviation for your consideration, and to suggest two of what I consider the most important legislative priorities springing from those truths. Taken together, I anticipate that these points will make the case that the time for more active congressional involvement is now, not later.

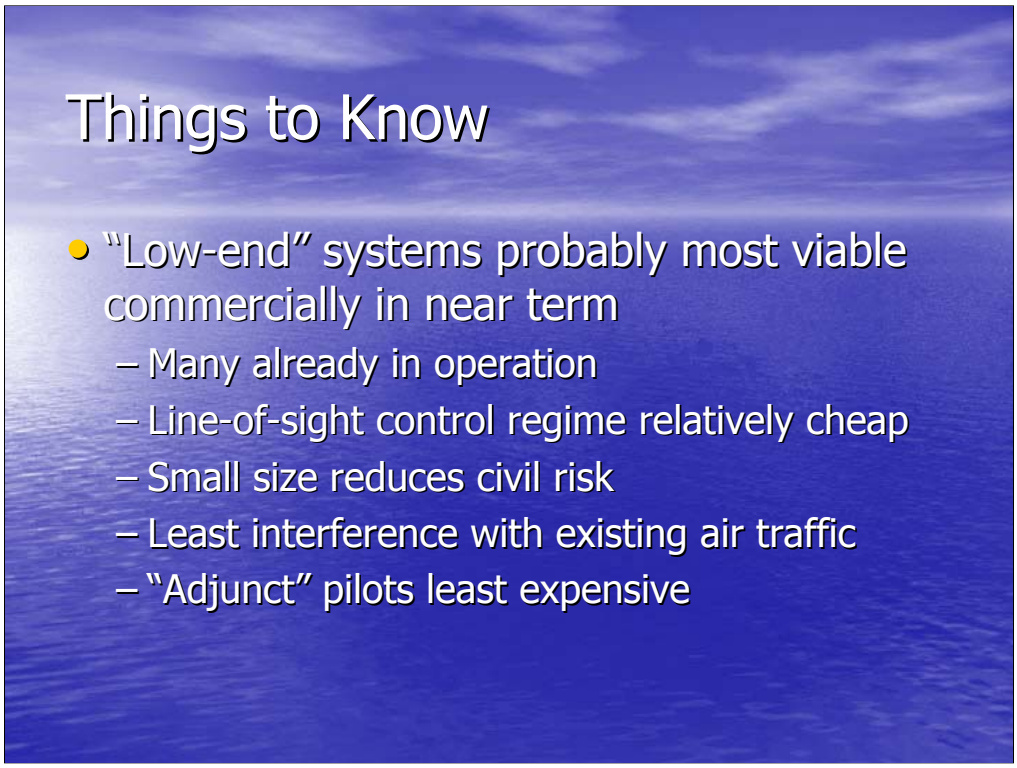

Things to Know



First, it is important that we all understand that commercial unmanned operations are a present reality. Private and commercial operators are flying thousands of unmanned aerial vehicles (UAVs) and systems (UASs) *and making money* in this country and around the world. I list a few application areas on this slide for illustration. But, there literally are hundreds of applications for these systems, and creative people are finding new ones every day.

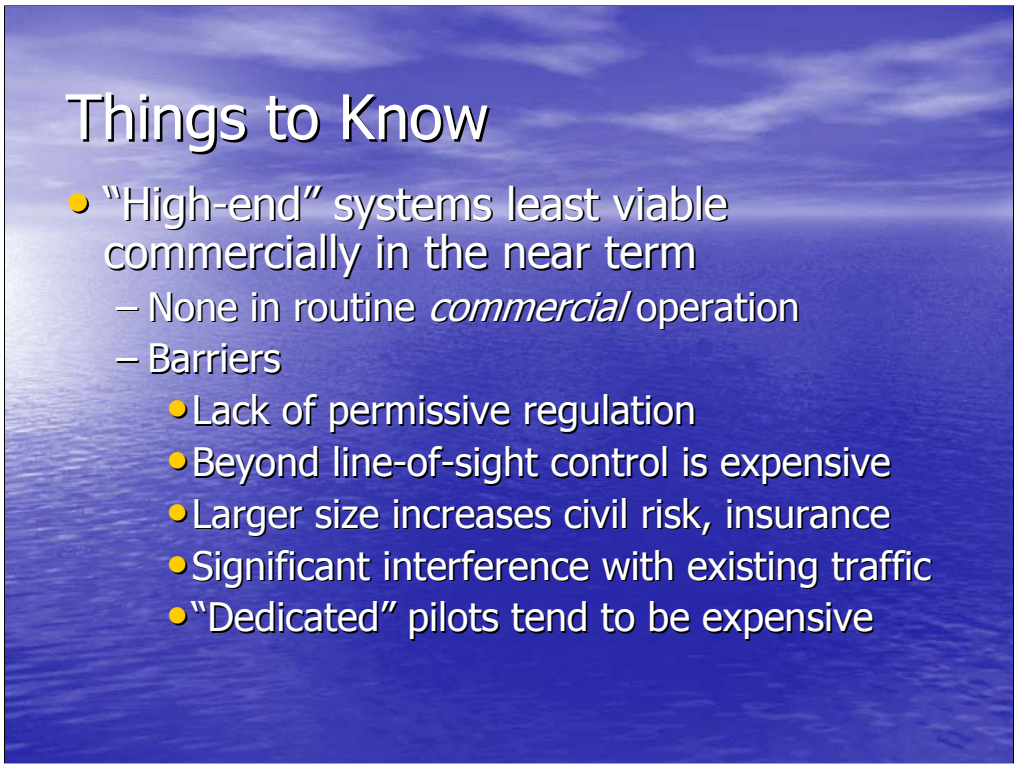
The problem in this country is that there is no body of law or regulation that enables the conduct of routine, safe, and profitable unmanned commercial flight. While the FAA's Advisory Circular 91-57 *Model Aircraft Operating Standards* covers the flight of recreational model aircraft, neither it nor any other document allows people to fly similar or more sophisticated aircraft for pay. If, for example, I use a 3-pound, radio-controlled aircraft to photograph my house for fun, AC 91-57 makes that a legal operation. If, on the other hand, I use the same aircraft on the same flight, to photograph my neighbor's house for $10, I am operating outside the bounds of regulatory approval.

I have spoken to several small UAS operators about this issue, and all say that this absence of regulatory permission presents them with the choice of not operating at all, or operating without insurance and in violation of the basic rule that you can't fly unless the FAA says you can fly.



Virtually all of the systems operating commercially today are low-end systems. What I call "low end systems" are based on small aircraft, often only a few pounds in weight, controlled directly by operators maintaining visual, line-of-sight, contact with their aircraft and their operating environments. The control systems they utilize may be automated, manual, or semi manual and involve minimal pilot flight skills and aviation knowledge.

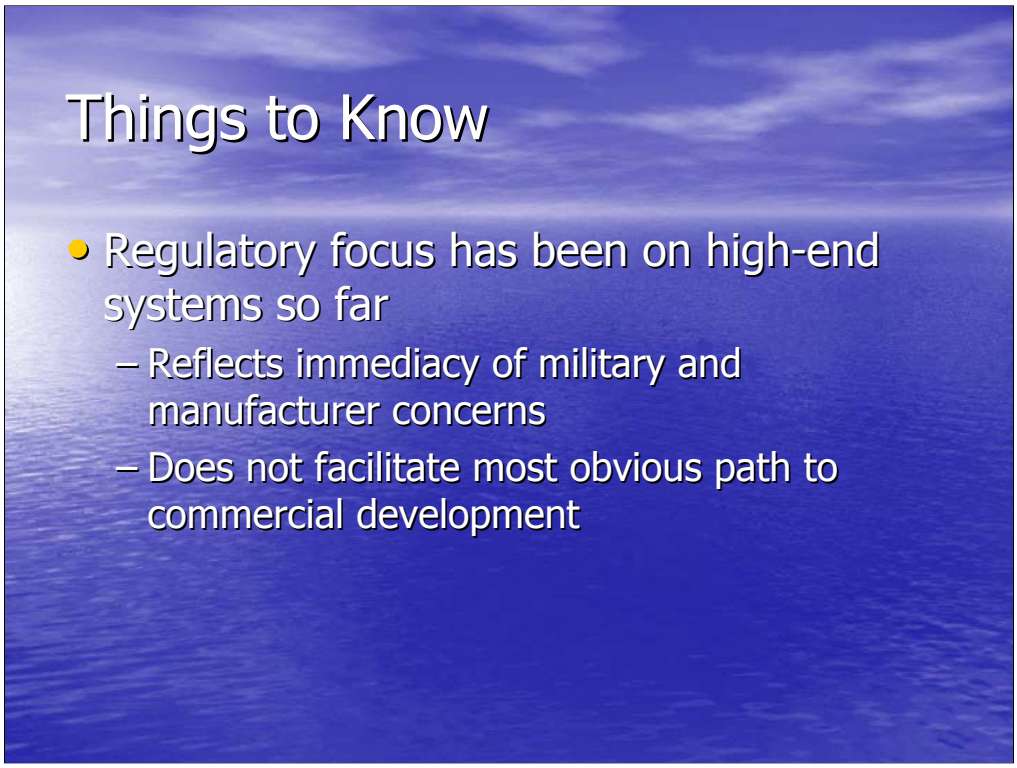
As the bullets to this slide indicated, their advantages include a relatively cheap control system costing from a few hundred to a few thousand dollars, a small size that allows even uninsured operators to take the risk, and operating patterns that usually don't require flying more than a few hundred feet above the ground, well below normal air traffic. Not often recognized, is the economic benefit of their operation by what I call "adjunct pilots." Adjunct pilots fly UAVs in the same way that you and I use our personal computers, as an adjunct to our primary job, not as the focus of our professional endeavors. So, apart from some minimal training, our sporadic employment as computer operators does not represent a major cost factor in measuring the productivity of the machines.



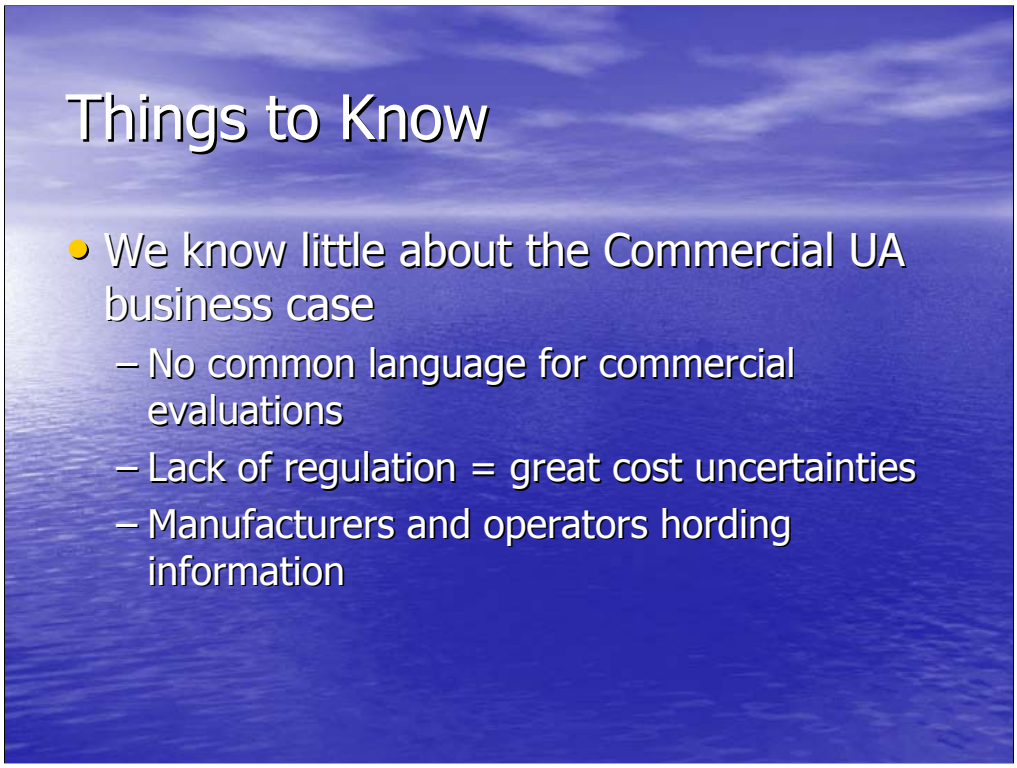
In contrast, no high-end UASs have entered the civil government or commercial markets on a routine basis. By "high end" I mean systems that tend to be large, perhaps tons in weight, and, most importantly, that operate outside of the visual range or even beyond the electronic horizon of the operator. There certainly have been many experimental explorations of the utility of high-end UASs in areas ranging from border patrol to environmental surveillance.

But, so far at least, they have attracted minimal long-term interest from civil operators and have booked no orders from operators planning to use them in U.S. airspace, at least to my knowledge.

The current barriers to applying high-end UAS to commercial operations are profound. Most importantly, the absence of permissive regulation makes it impossible for operators to put them into the national airspace routinely or predictably. Also, their control infrastructures, whether terrestrial- or space-based, repeaters are expensive. The size of these systems represent significant risks to other aircraft and people on the ground, resulting in high insurance costs. Last, the "flight" and support crews of these high-end systems normally are more expensive than the crews of manned aircraft doing equivalent missions.



As I believe this panel is aware already, the focus of UA regulatory development has been on high-end systems. This focus on so-called Medium- and High-Altitude-High-Endurance (MALE and HALE) systems, such as Predator and Global Hawk has made sense, given the immediate interest of the military and the major manufacturers providing its unmanned aerial systems. But, from a commercial perspective, this focus is ironic, since it serves realms of UA that are least likely to be viable economically on a *large scale and in the near term*, and ignores the low-end realm that has become economically active despite the neglect.



Now, I'm throwing around the term "economic viability" somewhat loosely here, since there exists no authoritative, easily available body of information on this subject. At least in the course of my two-years of study of commercial UA, I have found no compendium of papers, journal series, public study, or equivalent that examines the commercial characteristics of unmanned aviation rigorously. I have found bits and pieces of information about system costs, reliability and safety statistics, and sensor capabilities, but nothing comprehensive. To the extent that open-source studies exist, they usually argue simplistically that increased automation of UAS control systems will reduce or eliminate crew overheads which, along with improvements in vehicle reliability and FAA regulation, will allow UASs to penetrate commercial markets broadly and deeply.

The absence of a common analytical language about things like the categories of commercial UA operations and cost calculations also hinders rigorous discussions of their economics and business attributes.

Likewise, we need some regulator decisions on things like control system, crew member, and safety standards to provide a basis for making creditable calculations of costs and profits.

Last, and this is my pet peeve as an academic, most manufactures hold their cost, reliability, capabilities, and other informational cards pretty close to their proprietary chests. I understand their motives, but they need to be a little more forthcoming, if they want to build the foundations of general knowledge that will allow large communities of customers to identify UA as an attractive realm of investment.

If we had the time today, I could provide a much longer list of commercial UA regulatory requirements. But, knowing full well that you will be "hooking" me in a minute or so, I'll limit myself to suggesting two general priorities I hope you will bear in mind.

Above all else, I would encourage the Congress to take action now to accelerate the entry of UA into the national airspace and economy.

The next step in the process might well be to charter a GAO and/or other studies to (1) summarize the insights gained so far through existing studies by ACCESS-5, the Radio Technical Commission for Aeronautics, the ASTM, and other organizations, and to make appropriate recommendations for the economic, operational, and certification categorizations of UA.

This also would be a good time to pull together a relatively compact "tiger team" of government, industry, and academic thinkers to provide a summary assessment of near term legislative and regulatory requirements, and perhaps draft language, to ease military and civil operations in the national airspace and to promote the development of commercial UA.

The requirements of low-end commercial operators should receive some priority in all this, since they are the ones champing at the bit to get into business, at least openly.

Meanwhile, Congress needs to encourage the FAA to streamline and energize its process for granting certificates of authorization for military and commercial operations under appropriate restrictions. Right now, the FAA's reticence at authorizing UA operations is probably the industry's number 1 grievance. Indeed, I recently spoke to the president of a successful UAS

Second, and based on my discussions with a number of private and governmental practitioners in this field, Congress needs to charter a Federal "Knowledge Manager" for Commercial Unmanned Aviation. The role of this Knowledge Manager will be to provide a single Office of Primary Responsibility for advising and supporting other civil agencies moving into UA activities, overseeing and in some cases funding research and development of relevance to civil and commercial operators, and encouraging the public dissemination of useful information and knowledge.

There is a imminent need for such a Knowledge Manager. Federal and state agencies ranging from the Department of Homeland Defense to the Highway Patrol are interested and unevenly engaged in exploring the application of UA to their missions. But, they do not have a single source of objective and comprehensive advice and support available to them within the government to help them make effective and efficient decisions about applying UA to their tasks.

A Knowledge manager would provide such a source of support. By performing the functions I've listed here on the slide, it would increase the confidence and decrease the costs of integrating UA into the civil realm and, thereby, indirectly assist with its integration into the commercial realm.

I personally do not have a clear idea of where such a Knowledge Manager should reside, but I would think that NASA, the FAA, the Department of Transportation, or the Department of Commerce would be obvious candidates. I would be honored to be part of the process making that determination or otherwise assisting with the development of American unmanned aviation in any way that I can.

With that, let me thank you all again for the privilege of voicing my views and concerns in such lofty environs, and I am prepared to field any further questions you might have. Thank you.